PATENT ABSTRACTS OF JAPAN

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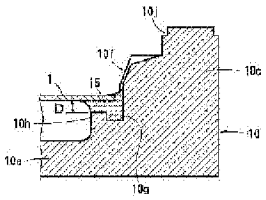
(71)Applicant : **MURATA MFG CO LTD**

(72)Inventor : **NAKAMURA YOSHITAKA**
TAJIMA KIYOTAKA
TAKESHIMA TETSUO
YOKOI YUKO
OKUZAWA TADASHI

(54) **PIEZOELECTRIC ELECTROACOUSTIC TRANSDUCER**



(57)Abstract:

PROBLEM TO BE SOLVED: To provide a piezoelectric electroacoustic transducer in which the gap between a diaphragm and a casing can be sealed surely even if a low viscosity elastic sealant is employed and the oscillation characteristics of the diaphragm are enhanced.

SOLUTION: The piezoelectric electroacoustic transducer comprises a square piezoelectric diaphragm 1 bending in the thickness direction upon application of an AC signal between the electrodes, a casing 10 for containing the piezoelectric diaphragm 1, and an elastic sealant 15 for sealing the gap between the circumferential edge part of the diaphragm 1 and the inner side face of the casing 10. A part 10f for supporting at least two opposite sides or the corner part of the diaphragm 1 is provided in the casing 10, a groove part 10g filled with the sealant 15 is provided at a position facing the circumferential edge part of the diaphragm 1 in the casing 10, and a wall part 10h for blocking outflow of the sealant 15 to the bottom wall part 10a of the casing 10 is provided lower than the supporting part 10f at the inner circumference of the groove part 10g.

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CLAIMS

[Claim(s)]

[Claim 1] The piezo-electric diaphragm of the square which carries out crookedness vibration in the thickness direction by impressing an alternation signal to inter-electrode, In the piezo-electric mold electroacoustic transducer equipped with the elastic sealing agent which closes between the case which contains the above-mentioned piezo-electric diaphragm, and the periphery sections of the above-mentioned diaphragm and the medial surfaces of a case The supporter which supports the corner section of the two sides or the piezo-electric diaphragm with which a piezo-electric diaphragm counters at least is formed in the interior of the above-mentioned case. Are the interior of the above-mentioned case and the slot for being filled up with the above-mentioned elastic sealing agent is established in the periphery section of a piezo-electric diaphragm, and the location which counters. The piezo-electric mold electroacoustic transducer characterized by the thing which regulate that it is lower than the above-mentioned supporter, and the above-mentioned elastic sealing agent flows into the inner circumference side of the above-mentioned slot to the bottom wall section of a case, and which it flowed and was established for the wall for stops.

[Claim 2] The piezo-electric mold electroacoustic transducer according to claim 1 characterized by making spacing of the top face of the above-mentioned wall for

flow stops, and the rear face of a diaphragm into spacing which a liquid stop produces with the surface tension of an elastic sealing agent.

[Claim 3] The above-mentioned case is a piezo-electric mold electroacoustic transducer according to claim 1 or 2 characterized by preparing the height of the shape of a taper which consists of a concave case where it has the bottom wall section and the side-attachment-wall section, and a cover plate pasted up on the side-attachment-wall section top face of a case, and guides the periphery section of a piezo-electric diaphragm to the side-attachment-wall section inside of the above-mentioned case.

[Claim 4] The above-mentioned case is a piezo-electric mold electroacoustic transducer according to claim 1 to 3 characterized by having consisted of a concave case where it has the bottom wall section and the side-attachment-wall section, and a cover plate pasted up on the side-attachment-wall section top face of a case, and for the above-mentioned elastic sealing agent having crept up to the upper limb inside of the side-attachment-wall section of the above-mentioned case, and forming the crevice for regulation.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to piezo-electric mold electroacoustic transducers, such as a piezo-electric receiver and a piezo-electric sounder.

[0002]

[Description of the Prior Art] Conventionally, in electronic equipment, home electronics, a portable telephone, etc., the piezo-electric mold electroacoustic transducer is widely used as the piezo-electric sounder which generates an alarm tone and a sound of operation, or a piezo-electric receiver. Its thing of the structure which closed opening of a case with covering is common while this kind of piezo-electric mold electroacoustic transducer sticks a circular piezoelectric device on one side of a circular metal plate, constitutes a uni-morph mold diaphragm, and silicone rubber is used for it and it supports the periphery section of a metal plate in a circular case. However, when the circular diaphragm was used, there was a trouble that productive efficiency was bad and it was difficult for sound conversion efficiency to constitute low and small.

[0003] Then, the piezo-electric mold electroacoustic transducer of the surface mount mold which enabled improvement in productive efficiency, the improvement in sound conversion efficiency, and a miniaturization is proposed by using a square diaphragm (JP,2000-310990,A). The insulating case where this piezo-electric mold electroacoustic transducer had the supporter which supports a diaphragm a square piezo-electric diaphragm and inside the two side-attachment-wall sections which counter, and the terminal for external connection was prepared in the supporter, While two sides and supporter with which it has the cover plate which has a sound emission hole, a diaphragm is contained in a case, and a diaphragm counters are fixed with adhesives or an elastic sealing agent The closure of the clearance between remaining two sides and cases of a diaphragm is carried out with an elastic sealing agent, a diaphragm and a terminal are electrically connected by electroconductive glue, and it has structure

which the cover plate pasted up on the side-attachment-wall section opening edge of a case. Although the above-mentioned electroacoustic transducer uses the piezo-electric diaphragm of a uni-morph mold, what used the piezo-electric diaphragm which consists of electrostrictive ceramics of a laminated structure is known (JP,2001-95094,A).

[0004]

[Problem(s) to be Solved by the Invention] In the former, two sides of a diaphragm are fixed to a case and the closure of remaining two sides or four-side perimeters is carried out with an elastic sealing agent. Thus, between a diaphragm and cases is closed for isolating the space of the front flesh side of a diaphragm and forming sound space in the front flesh side of a diaphragm. Soft spring materials, such as silicone rubber, are used so that an elastic sealing agent may not control vibration of a diaphragm as much as possible.

[0005] An elastic sealing agent is applied and hardened between the side edge of a diaphragm, and the inside of a case. If the silicone rubber of a room-temperature-setting mold etc. is used as an elastic sealing agent, since hardening after spreading is early, as shown in drawing 12 , the clearance between a diaphragm 40 and a case 41 can be closed easily. However, when the elastic sealing agent 42 of a room-temperature-setting mold is used, hardening is started in the middle of spreading, it is easy to generate plugging in a coater, and workability is bad. Moreover, the Young's modulus after hardening is also high and there is fault which controls vibration of a diaphragm 40.

[0006] Then, by not starting hardening in the middle of spreading, if viscosity uses the silicone rubber of a low (thixotropy is low) heat-curing mold, since the Young's modulus after hardening is low, there is an advantage of not controlling vibration of a diaphragm 40. However, if the viscous low elastic sealing agent 43 is used, as shown in drawing 13 , the elastic sealing agent 43 will flow to the base side of a case 41, and the fault that between a diaphragm 40 and cases 41 cannot be closed will occur.

[0007] Then, even if a viscous low elastic sealing agent is used for the purpose of

this invention, it can close the clearance between a diaphragm and a case certainly, and it is to offer the good piezo-electric mold electroacoustic transducer of the oscillation characteristic of a diaphragm.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention concerning claim 1 The piezo-electric diaphragm of the square which carries out crookedness vibration in the thickness direction by impressing an alternation signal to inter-electrode, In the piezo-electric mold electroacoustic transducer equipped with the elastic sealing agent which closes between the case which contains the above-mentioned piezo-electric diaphragm, and the periphery sections of the above-mentioned diaphragm and the medial surfaces of a case The supporter which supports the corner section of the two sides or the piezo-electric diaphragm with which a piezo-electric diaphragm counters at least is formed in the interior of the above-mentioned case. Are the interior of the above-mentioned case and the slot for being filled up with the above-mentioned elastic sealing agent is established in the periphery section of a piezo-electric diaphragm, and the location which counters. It is lower than the above-mentioned supporter, and the inner circumference side of the above-mentioned slot is provided with the piezo-electric mold electroacoustic transducer characterized by the thing which regulate that the above-mentioned elastic sealing agent flows out to the bottom wall section of a case, and which it flowed and was established for the wall for stops.

[0009] If a viscous low elastic sealing agent is applied between the periphery section of a diaphragm, and the medial surface of a case, an elastic sealing agent tends to flow into the bottom wall section side of a case through the clearance between a diaphragm and a case. However, an elastic sealing agent flows into the slot established in the case, and since it flows and is dammed up by the wall for stops, it is prevented that an elastic sealing agent flows out of into the bottom wall section side of a case in having been further formed in the inner circumference of this slot. Therefore, an elastic sealing agent intervenes between

the periphery section of a diaphragm, and the medial surface of a case, and between both can be closed certainly. The height of the above-mentioned wall for flow stops is lower than the supporter which supports a diaphragm. Therefore, it flows at the rear face of a diaphragm, the wall for stops does not contact, and vibration of a diaphragm is not checked. Consequently, the good piezo-electric mold electroacoustic transducer of an oscillation characteristic is obtained.

[0010] Like claim 2, it flows and spacing of the top face of the wall for stops and the rear face of a diaphragm has good spacing which is extent which a liquid stop produces with the surface tension of the elastic sealing agent before hardening. For example, when the viscosity before hardening of an elastic sealing agent is 1300 mPa-s, it is good to set the above-mentioned spacing to 0.2mm or less. It is because an elastic sealing agent may flow into the bottom wall section side of a case if the above-mentioned spacing is made large too much.

[0011] It is good to prepare the height of the shape of a taper which consists of cover plates which paste up a case on the side-attachment-wall section top face of the concave case where it has the bottom wall section and the side-attachment-wall section, and a case, like claim 3, and guides the periphery section of a piezo-electric diaphragm to the side-attachment-wall section inside of a case. Although a piezo-electric diaphragm carries out crookedness vibration in the thickness direction by impressing an alternation signal to inter-electrode, if the periphery section contacts the medial surface of a case in a large area, vibration of a diaphragm will be controlled and sound pressure will fall. Then, control of vibration is prevented by preparing the height of the shape of a taper which contacts in the periphery section and small area of a diaphragm in the side-attachment-wall section inside of a case. Moreover, since a height has a guide function, outside the inside dimension of a case, and a diaphragm, variation of tolerance with ** can be made as small as possible, and small piezo-electric sound components can be obtained.

[0012] When constituted from a cover plate which pastes up a case on the side-attachment-wall section top face of the concave case where it has the bottom

wall section and the side-attachment-wall section, and a case, like claim 4, it is good for an elastic sealing agent to creep up to the upper limb inside of the side-attachment-wall section of a case, and to form the crevice for regulation in it. When pasting up a cover plate on the top face of the side-attachment-wall section of a case and the elastic sealing agent has been up to a side-attachment-wall section top face, the bond strength of a cover plate may fall and an air leak may arise to the sound space formed in the side front of a diaphragm. Then, the bond strength of a cover plate is securable by preventing in the crevice which the elastic sealing agent crawled and formed the riser in the upper limb inside of the side-attachment-wall section of a case.

[0013]

[Embodiment of the Invention] Drawing 1 shows an example of the piezo-electric mold electroacoustic transducer of the surface mount mold concerning this invention. The electroacoustic transducer of this operation gestalt fitted the application corresponding to the frequency of a large range like a piezo-electric receiver, and is equipped with the piezo-electric diaphragm 1, the case 10, and cover plate 20 of a laminated structure. Here, a case consists of a case 10 and a cover plate 20.

[0014] As shown in drawing 2 and drawing 3 , as for a diaphragm 1, the laminating of the two-layer electrostrictive ceramics layers 1a and 1b is carried out, the principal plane electrodes 2 and 3 are formed in the front flesh-side principal plane of a diaphragm 1, and the internal electrode 4 is formed among the ceramic layers 1a and 1b. As a thick wire arrow head shows, in the thickness direction, polarization of the two ceramic layers 1a and 1b is carried out in the same direction. The principal plane electrode 2 on a side front and the principal plane electrode 3 on a background are formed a little shorter than the side length of a diaphragm 1, and the end is connected to the end-face electrode 5 formed in one end face of a diaphragm 1. Therefore, the principal plane electrodes 2 and 3 of a front flesh side are connected mutually. The internal electrode 4 was mostly formed in the symmetry configuration with the principal plane electrodes 2 and 3,

it is separated from the end of an internal electrode 4 of the internal electrode with the above-mentioned end-face electrode 5, and the other end is connected to the end-face electrode 6 formed in the other end side of a diaphragm 1. In addition, the end-face electrode 6 and the flowing auxiliary electrode 7 are formed in the front rear face of the other end of a diaphragm 1.

[0015] The wrap resin layers 8 and 9 are formed in the front rear face of a diaphragm 1 in the principal plane electrodes 2 and 3. These resin layers 8 and 9 are protective layers prepared in order to prevent the crack of the diaphragm 1 by the fall impact. The notches 8a and 9a which the principal plane electrodes 2 and 3 expose near the corner section of the vertical angle of a diaphragm 1, and the notches 8b and 9b which an auxiliary electrode 7 exposes are formed in the resin layers 8 and 9 of a front flesh side. In addition, although Notches 8a, 8b, 9a, and 9b may be formed only in front flesh-side one side, in order to abolish the directivity of a front flesh side, in this example, it has prepared in the front rear face. Moreover, it is not necessary to use an auxiliary electrode 7 as the band electrode of constant width, and only the part corresponding to Notches 8b and 9b may be established. Here, the 10mmx10mmx40micrometer PZT system ceramics was used as ceramic layers 1a and 1b, and the polyamidoimide system resin whose thickness is 3-10 micrometers as resin layers 8 and 9 was used.

[0016] The case 10 is formed in the core box of the square which has bottom wall section 10a and the four side-attachment-wall sections 10b-10e with a resin ingredient as shown in drawing 4 - drawing 10 . As a resin ingredient, heat-resistant resin, such as LCP (liquid crystal polymer), SPS (syndiotactic polystyrene), PPS (polyphenylene sulfide), and epoxy, is desirable. the inside of the two side-attachment-wall sections 10b and 10d which counter among the four side-attachment-wall sections 10b-10e -- the two forks of terminals 11 and 12 -- the inside connections 11a and 12a of a ** are exposed. Terminals 11 and 12 have the configuration as shown in drawing 11 , and insert molding is carried out to the case 10. The outside connections 11b and 12b exposed to the exterior of a case 10 are bent to the base side of a case 10 along the external surface which

is the side-attachment-wall sections 10b and 10d (refer to drawing 6).

[0017] 10f of supporters for supporting the corner section of a diaphragm 1 is formed in four corners inside a case 10. 10f of this supporter is formed lower one step than the exposure of the inside connections 11a and 12a of the above-mentioned terminals 11 and 12. Therefore, if a diaphragm 1 is laid on 10f of supporters, the top panel of a diaphragm 1 and the top face of the inside connections 11a and 12a of terminals 11 and 12 will become the same height mostly.

[0018] Moreover, 10g of slots for filling up the periphery of bottom wall section 10a of a case 10 with the elastic sealing agent 15 mentioned later is prepared, and 10h of walls for flow stops lower than the 10f of the above-mentioned supporters is prepared in the inside which is 10g of this slot. It flows and, as for 10h of walls for stops, the elastic sealing agent 15 has the function to regulate this flowing into bottom wall section 10a. 10g of slots is formed in the shallow bottom so that the base of 10g of slots may be located in a location higher than the top face of bottom wall section 10a and 10g of slots may be filled with this operation gestalt with the comparatively little elastic sealing agent 15. Although 10g of slots and 10h of walls are prepared in the periphery of bottom wall section 10a except the part which applies the elastic support material or adhesives 15 mentioned later, they may be prepared in the perimeter of bottom wall section 10a.

[0019] Moreover, height 10i of the shape of a taper which guides four sides of the piezo-electric diaphragm 1 is prepared in the inside of the side-attachment-wall sections 10b-10e of a case 10. Two height 10i is prepared at a time in each side-attachment-wall sections 10b-10e, respectively. The elastic sealing agent 15 creeps up in the upper limb inside of the side-attachment-wall sections 10b-10e of a case 10, and crevice 10j for regulation is formed in it. Moreover, 1st sound emission hole 10k is formed in bottom wall section 10a of side-attachment-wall section 10e approach. 10m of positioning heights of the abbreviation L typeface for carrying out fitting maintenance of the corner of a cover plate 20 is formed in

the corner section top face of the side-attachment-wall sections 10b-10e of a case 10. 10n of taper sides for guiding a cover plate 20 is formed in the inside of 10m of these heights.

[0020] A diaphragm 1 is contained by the case 10 and the corner section is supported by 10f of supporters. Since the periphery section of a diaphragm 1 is guided by height 10i of the shape of a taper prepared in the inside of the side-attachment-wall sections 10b-10e of a case 10 at this time, the corner section of a diaphragm 1 is correctly laid on 10f of supporters. By preparing taper-like height 10i especially, path clearance of a diaphragm 1 and a case 10 can be narrowed beyond the precision which inserts a diaphragm 1, consequently a product dimension can be made small. Moreover, since the touch area of height 10i and the periphery section of a diaphragm 1 is small, it can prevent checking vibration of a diaphragm 1.

[0021] After containing a diaphragm 1 in a case 10, it is fixed to the inside connections 11a and 12a of terminals 11 and 12 by applying the elastic support material 13 to four places, as shown in drawing 10 . That is, the elastic support material 13 is applied between the principal plane electrode 2 exposed to notch 8a in a diagonal location, and one inside connection 11a of a terminal 11, and between the auxiliary electrode 7 exposed to notch 8b, and one inside connection 12a of a terminal 12. Moreover, the elastic support material 13 is applied about two in the remaining diagonal location. In addition, although the elastic support material 13 was applied to an oblong ellipse form or an oblong ellipse here, a spreading configuration is not restricted to this. As elastic support material 13, adhesives with the comparatively low Young's modulus after hardening, for example, the urethane system adhesives which are 3.7x106 Pa extent, are used, for example. Moreover, as for the elastic support material 13, what has the property in which viscosity in the condition of not hardening cannot permeate easily highly (for example, 50 - 120 dPa-s) is good. The reason is for the elastic support material's 13 flowing below and making it not fall through the clearance between a diaphragm 1 and a case 10, when the elastic support

material 13 is applied. Heat hardening is carried out after applying the elastic support material 13. In addition, as the fixed approach of a diaphragm 1, after containing a diaphragm 1 in a case 10, the elastic support material 13 may be applied by a dispenser etc., but where the elastic support material 13 is beforehand applied to a diaphragm 1, a diaphragm 1 may be held in a case 10.

[0022] After stiffening the elastic support material 13, electroconductive glue 14 is applied to an ellipse form or an elongated shape so that the elastic support material 13 top may be crossed, and the principal plane electrode 2, inside connection 11a of a terminal 11 and an auxiliary electrode 7, and inside connection 12a of a terminal 12 are connected, respectively. As electroconductive glue 14, the urethane system conductive paste of 0.3x109 Pa is used, for example for the Young's modulus after hardening. After applying electroconductive glue 14, heat hardening of this is carried out. The spreading configuration of electroconductive glue 14 is not restricted to an ellipse form, and just connects the principal plane electrode 2, inside connection 11a and an auxiliary electrode 7, and inside connection 12a.

[0023] After applying and stiffening electroconductive glue 14, the elastic sealing agent 15 is applied to the clearance between the perimeter perimeter of a diaphragm 1, and the inner circumference section of a case 10, and the air leak between the side front of a diaphragm 1 and a background is prevented. Heat hardening is carried out after applying the elastic sealing agent 15 annularly. As an elastic sealing agent 15, the Young's modulus after hardening is low (for example, 3.0x105 Pa extent), and thermosetting adhesive with the low (for example, 1300 mPa-s) viscosity before hardening is used, for example. Here, silicone system adhesives were used.

[0024] Since the viscosity is low when the elastic sealing agent 15 is applied, there is a possibility that the elastic sealing agent 15 may flow and fall to bottom wall section 10a through the clearance between the piezo-electric diaphragm 1 and a case 10. However, since 10g of slots for being filled up with the elastic sealing agent 15 the periphery section of a diaphragm 1 and inside the case 10

which counters is prepared as shown in drawing 9 , it flows to the inside which is 10g of this slot and 10h of walls for stops is prepared, the elastic sealing agent 15 stops at 10g of slots, and flowing to bottom wall section 10a, and falling to it is prevented. Especially, by flowing, since 10h of walls for stops is lower than 10f of supporters, it flows with a diaphragm 1 and the minute clearance D is formed between 10h of walls for stops. It is necessary to make this clearance D into the dimension from which the liquid stop operation by the surface tension of the elastic sealing agent 15 is acquired, and when the viscosity of the elastic sealing agent 15 is 1300 mPa-s, it is good to set Clearance D to 0.2mm or less. Therefore, the elastic sealing agent 15 with which it overflowed from 10g of slots is dammed up in this clearance D, and the outflow to bottom wall section 10a is prevented certainly. In addition, it flows with a diaphragm 1 and Clearance D is formed for preventing that the vibration is controlled between 10h of walls for stops, when 10h of walls contacts the rear face of a diaphragm 1.

[0025] Moreover, some elastic sealing agents 15 may creep up the side-attachment-wall sections 10b-10e of a case 10, and it may adhere to the top face of the side-attachment-wall section. When the elastic sealing agent 15 is encapsulant with a mold-release characteristic, in case a cover plate 20 is pasted up on the top face of the side-attachment-wall sections 10b-10e later, there is a possibility that bond strength may fall. However, since the elastic sealing agent 15 creeps up to the upper limb inside of the side-attachment-wall sections 10b-10e and crevice 10j for regulation is formed in it, it can prevent that the elastic sealing agent 15 adheres to the top face of the side-attachment-wall section.

[0026] After fixing a diaphragm 1 to a case 10 as mentioned above, a cover plate 20 pastes the side-attachment-wall section top face of a case 10 with adhesives 21. The cover plate 20 is formed in plate-like with the same ingredient as a case 10. The periphery section of a cover plate 20 engages with 10n of inside taper sides of 10m of heights for positioning which protruded on the side-attachment-wall section top face of the above-mentioned case 10, and is positioned correctly. By pasting up a cover plate 20 on a case 10, sound space is formed between a

cover plate 20 and a diaphragm 1. The 2nd sound emission hole 22 is formed in the cover plate 20. The piezo-electric mold electroacoustic transducer of a surface mount mold is completed as mentioned above.

[0027] At the electroacoustic transducer of this operation gestalt, crookedness vibration of the diaphragm 1 can be carried out in area crookedness mode by impressing a predetermined alternation electrical potential difference between a terminal 11 and 12. Since the electrostrictive ceramics layer the direction of polarization and whose direction of electric field are the same directions is shrunken in the direction of a flat surface and the electrostrictive ceramics layer the direction of polarization and whose direction of electric field are hard flow is extended in the direction of a flat surface, it is crooked in the thickness direction as a whole. With this operation gestalt, a diaphragm 1 is the laminating structure of the ceramics, and since two oscillating fields (ceramic layer) arranged in order in the thickness direction vibrate to hard flow mutually, compared with a uni-morph mold diaphragm, the big amount of displacement, i.e., big sound pressure, can be obtained.

[0028] This invention is not limited to the above-mentioned operation gestalt, and can be changed in the range which does not deviate from the meaning of this invention. Although 10f of supporters is formed in four corners inside a case 10 and the four corner sections of a diaphragm 1 were supported by 10f of these supporters with the above-mentioned operation gestalt, a level difference-like supporter is formed in two sides which it replaces with this and a case 10 counters, and you may make it support two sides to which a diaphragm 1 counters on this supporter. The spreading field of an elastic sealing agent is not restricted to the perimeter perimeter of a diaphragm 1 like an operation gestalt, and when two sides and the supporter of a case with which a diaphragm counters as mentioned above are continuously fixed by elastic support material, it may apply an elastic sealing agent to the clearance between remaining two sides and cases.

[0029] Although the piezo-electric diaphragm 1 of the above-mentioned operation

gestalt carries out the laminating of the two-layer electrostrictive ceramics layer, what carried out the laminating of the three or more-layer electrostrictive ceramics layer may be used. Moreover, the well-known uni-morph mold or bimorph mold diaphragm which stuck the piezo-electric plate on one side or both sides of not only the layered product of an electrostrictive ceramics layer but a metal plate may be used as a piezo-electric diaphragm. What [not only] consisted of a case 10 of a concave cross-section configuration like an operation gestalt and a cover plate 20 pasted up on that top-face opening but an inferior surface of tongue may constitute the case of this invention from a case of the cap configuration which carried out opening, and a substrate adhered to the inferior surface of tongue of this case. In this case, what is necessary is just to form in the substrate the electrode pattern which serves as a terminal beforehand.

[0030]

[Effect of the Invention] Since it flowed at the above explanation inside the slot for filling up the interior of a case with an elastic sealing agent according to invention according to claim 1 so that clearly, and this slot and the wall for stops was prepared, even if it uses a viscous low elastic sealing agent, it is prevented that an elastic sealing agent flows into the base side of a case, and it can close certainly between the periphery section of a diaphragm, and the medial surfaces of a case with an elastic sealing agent. Therefore, since Young's modulus of the elastic sealing agent after hardening can be made low while being able to reconcile improvement in workability, and closure nature, the oscillation characteristic of a diaphragm also becomes good. Moreover, since it is lower than the supporter with which it flows and the height of the wall for stops supports a diaphragm, it flows at the rear face of a diaphragm, and the wall for stops does not contact, but it can prevent that vibration of a diaphragm is checked.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the decomposition perspective view of the 1st operation gestalt of the piezo-electric mold electroacoustic transducer concerning this invention.
[Drawing 2] It is the perspective view of the piezo-electric diaphragm used for the piezo-electric mold electroacoustic transducer of drawing 1 .
[Drawing 3] It is a stairway sectional view by the A-A line of drawing 2 .
[Drawing 4] It is the top view of the case used for the piezo-electric mold electroacoustic transducer of drawing 1 .
[Drawing 5] It is X-X-ray sectional view of drawing 4 .
[Drawing 6] It is the Y-Y line sectional view of drawing 4 .
[Drawing 7] It is the bottom view of the case shown in drawing 4 .
[Drawing 8] It is the expansion perspective view of the corner section of the case shown in drawing 4 .
[Drawing 9] It is an enlarged drawing in the condition of having applied the elastic sealing agent of the B section of drawing 5 .
[Drawing 10] It is a top view in the condition of having contained the diaphragm in the case shown in drawing 4 .
[Drawing 11] It is the perspective view of a terminal.
[Drawing 12] It is the sectional view of the conventional closure section at the time of using a hyperviscous elastic sealing agent.
[Drawing 13] It is the sectional view of the conventional closure section at the

time of using the elastic sealing agent of hypoviscosity.

[Description of Notations]

1 Piezo-electric Diaphragm

10 Case

10a Bottom wall section

10b-10d Side-attachment-wall section

10f Supporter

10g Slot

10h It flows and is a wall for stops.

10i Taper-like height

10j Creep up and it is a crevice for regulation.

13 Elastic Support Material

14 Electroconductive Glue

15 Elastic Sealing Agent

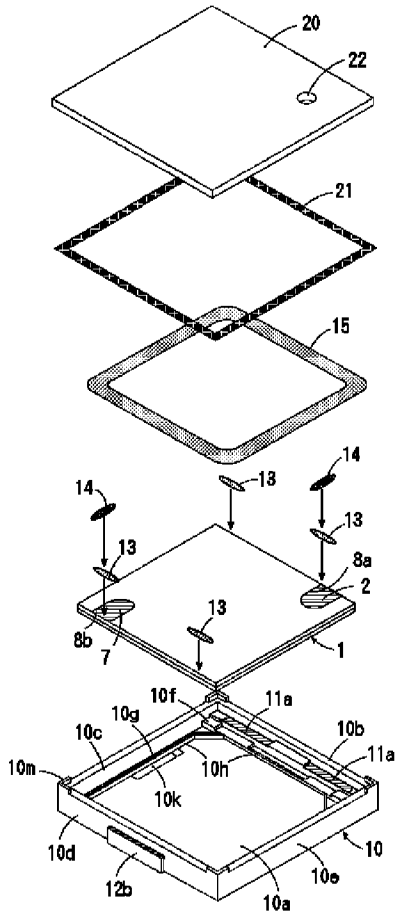
20 Cover Plate

[Translation done.]

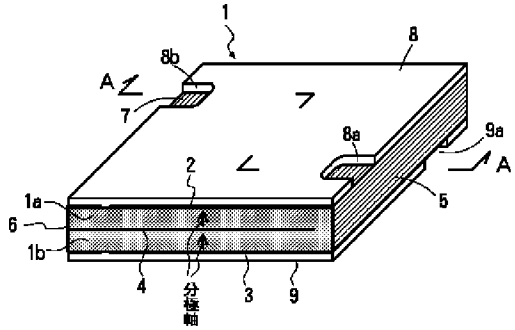
* NOTICES *

DRAWINGS

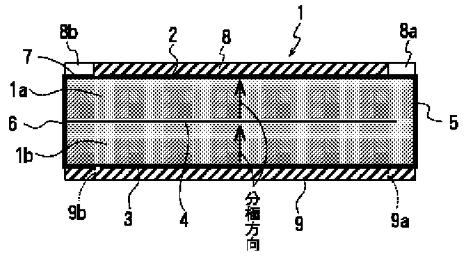
[Drawing 1]



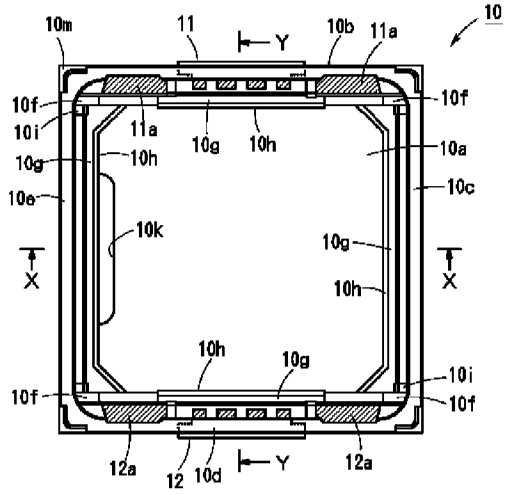
[Drawing 2]



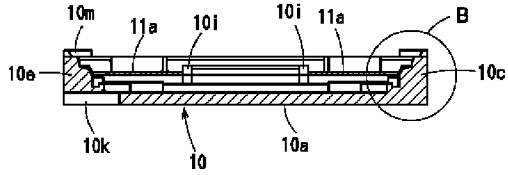
[Drawing 3]



[Drawing 4]



[Drawing 5]



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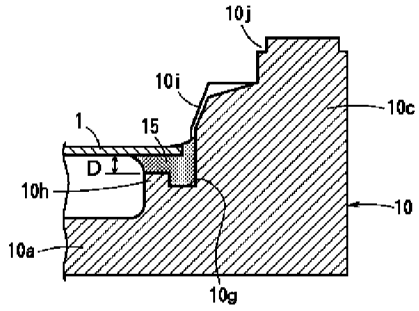

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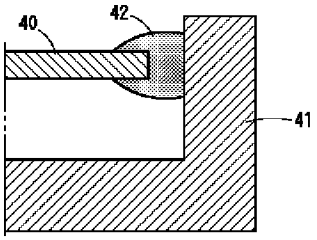

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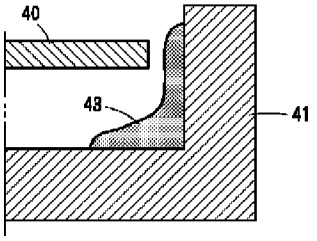

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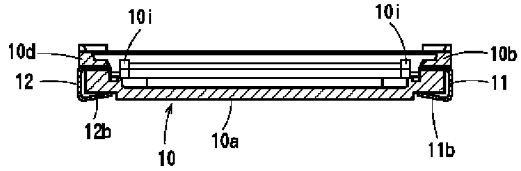

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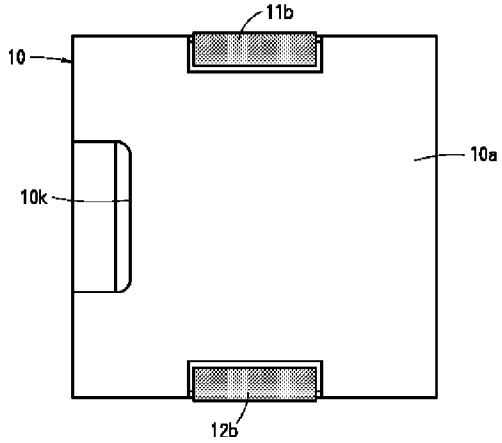

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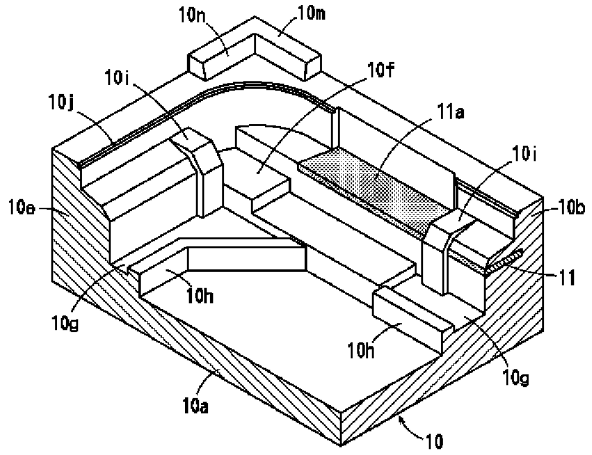

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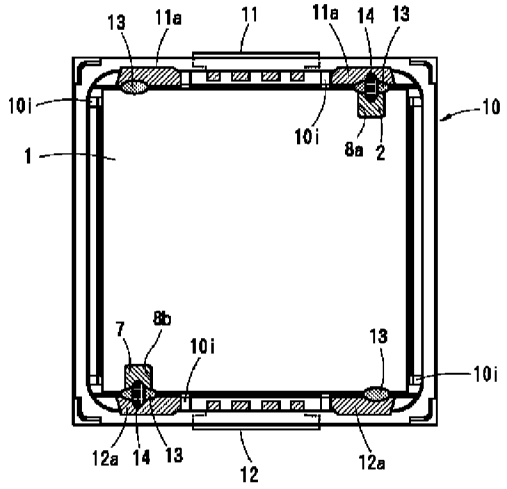

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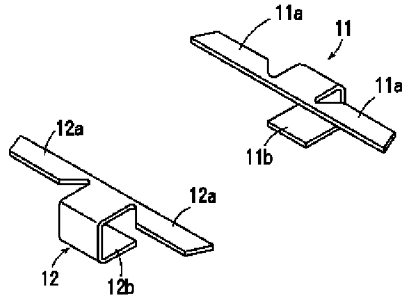

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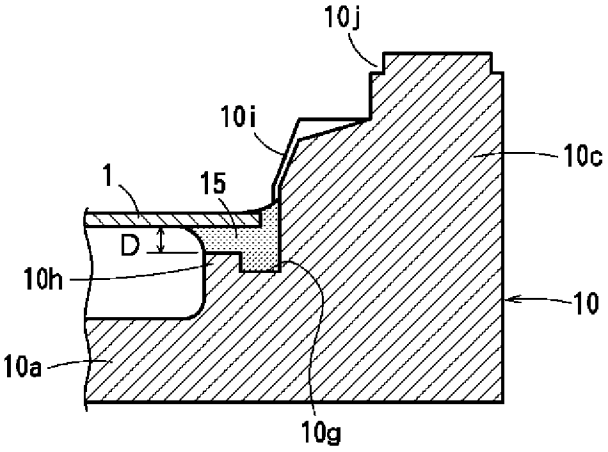
(71)出願人　000006231
株式会社村田製作所
京都府長岡京市天神二丁目26番10号
(72)発明者　中村　好孝
京都府長岡京市天神２丁目26番10号　株式会社村田製作所内
(72)発明者　田島　清隆
京都府長岡京市天神２丁目26番10号　株式会社村田製作所内
(74)代理人　100085497
弁理士　筒井　秀隆

最終頁に続く

(54)【発明の名称】　圧電型電気音響変換器

(57)【要約】
【課題】粘性の低い弾性封止材を用いても振動板と筐体との隙間を確実に封止でき、振動板の振動特性の良好な圧電型電気音響変換器を提供する。
【解決手段】電極間に交番信号を印加することにより厚み方向に屈曲振動する四角形の圧電振動板１と、圧電振動板１を収納する筐体１０と、振動板１の周縁部と筐体１０の内側面との間を封止する弾性封止材１５とを設けた圧電型電気音響変換器において、筐体１０の内部に、振動板１の少なくとも対向する２辺あるいは振動板１のコーナ部を支持する支持部１０ｆを設け、筐体１０の内部であって振動板１の周縁部と対向する位置に、弾性封止材１５を充填するための溝部１０ｇを設け、この溝部１０ｇの内周に、支持部１０ｆより低く、弾性封止材１５が筐体１０の底壁部１０ａへ流れ出るのを規制する流れ止め用壁部１０ｈを設けた。



【特許請求の範囲】
【請求項１】電極間に交番信号を印加することにより厚み方向に屈曲振動する四角形の圧電振動板と、上記圧電振動板を収納する筐体と、上記振動板の周縁部と筐体の内側面との間を封止する弾性封止材とを備えた圧電型電気音響変換器において、上記筐体の内部に、圧電振動板の少なくとも対向する２辺あるいは圧電振動板のコーナ部を支持する支持部を設け、上記筐体の内部であって、圧電振動板の周縁部と対向する位置に、上記弾性封止材を充填するための溝部を設け、上記溝部の内周側に、上記支持部より低く、上記弾性封止材が筐体の底壁部へ流れ出るのを規制する流れ止め用壁部を設けたことを特徴とする圧電型電気音響変換器。
【請求項２】上記流れ止め用壁部の頂面と振動板の裏面との間隔を、弾性封止材の表面張力により液止まりが生じる間隔としたことを特徴とする請求項１に記載の圧電型電気音響変換器。
【請求項３】上記筐体は底壁部と側壁部とを有する凹型のケースと、ケースの側壁部頂面に接着される蓋板とで構成され、上記ケースの側壁部内面に、圧電振動板の周縁部をガイドするテーパ状の突起部を設けたことを特徴とする請求項１または２に記載の圧電型電気音響変換器。
【請求項４】上記筐体は底壁部と側壁部とを有する凹型のケースと、ケースの側壁部頂面に接着される蓋板とで構成され、上記ケースの側壁部の上縁内面に、上記弾性封止材のはい上がり規制用の凹部を形成したことを特徴とする請求項１ないし３のいずれかに記載の圧電型電気音響変換器。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は圧電レシーバや圧電サウンダなどの圧電型電気音響変換器に関するものである。
【０００２】
【従来の技術】従来、電子機器、家電製品、携帯電話機などにおいて、警報音や動作音を発生する圧電サウンダあるいは圧電レシーバとして圧電型電気音響変換器が広く用いられている。この種の圧電型電気音響変換器は、円形の金属板の片面に円形の圧電素子を貼り付けてユニモルフ型振動板を構成し、金属板の周縁部を円形のケースの中にシリコーンゴムを用いて支持するとともに、ケースの開口部をカバーで閉鎖した構造のものが一般的である。しかしながら、円形の振動板を用いると、生産効率が悪く、音響変換効率が低く、しかも小型に構成することが難しいという問題点があった。
【０００３】そこで、四角形の振動板を用いることで、生産効率の向上、音響変換効率の向上および小型化を可能とした表面実装型の圧電型電気音響変換器が提案されている（特開２０００－３１０９９０号）。この圧電型電気音響変換器は、四角形の圧電振動板と、対向する２つの側壁部の内側に振動板を支持する支持部を持ち、支持部に外部接続用の端子が設けられた絶縁性ケースと、放音孔を有する蓋板とを備え、ケース内に振動板が収納され、振動板の対向する２辺と支持部とが接着剤または弾性封止材で固定されるとともに、振動板の残りの２辺とケースとの隙間が弾性封止材で封止され、振動板と端子とが導電性接着剤により電気的に接続され、ケースの側壁部開口端に蓋板が接着された構造となっている。上記電気音響変換器はユニモルフ型の圧電振動板を使用したものであるが、積層構造の圧電セラミックスよりなる圧電振動板を使用したものも知られている（特開２００１－９５０９４号）。
【０００４】
【発明が解決しようとする課題】従来では、振動板の２辺がケースに固定され、残りの２辺あるいは４辺全周が弾性封止材によって封止される。このように振動板とケースとの間を封止するのは、振動板の表裏の空間を隔離し、振動板の表裏に音響空間を形成するためである。弾性封止材はできるだけ振動板の振動を抑制しないよう、シリコーンゴムなどの柔らかな弾性材料が使用される。
【０００５】弾性封止材は振動板の側縁とケースの内面との間に塗布され、硬化される。弾性封止材として常温硬化型のシリコーンゴムなどを使用すると、塗布後の硬化が早いため、図１２に示すように振動板４０とケース４１との隙間を簡単に封止できる。しかし、常温硬化型の弾性封止材４２を使用すると、塗布の途中で硬化を開始してしまい、塗布装置に詰まりが発生しやすく、作業性が悪い。また、硬化後のヤング率も高く、振動板４０の振動を抑制してしまう不具合がある。
【０００６】そこで、粘性が低い（チクソ性が低い）熱硬化型のシリコーンゴムを使用すれば、塗布の途中で硬化を開始することがなく、かつ硬化後のヤング率が低いので、振動板４０の振動を抑制することがないという利点がある。しかし、粘性の低い弾性封止材４３を用いると、図１３に示すように、弾性封止材４３がケース４１の底面側へ流れてしまい、振動板４０とケース４１との間を封止できないという不具合が発生する。
【０００７】そこで、本発明の目的は、粘性の低い弾性封止材を用いても振動板と筐体との隙間を確実に封止でき、振動板の振動特性の良好な圧電型電気音響変換器を提供することにある。
【０００８】
【課題を解決するための手段】上記目的を達成するため、請求項１に係る発明は、電極間に交番信号を印加することにより厚み方向に屈曲振動する四角形の圧電振動板と、上記圧電振動板を収納する筐体と、上記振動板の周縁部と筐体の内側面との間を封止する弾性封止材とを備えた圧電型電気音響変換器において、上記筐体の内部に、圧電振動板の少なくとも対向する２辺あるいは圧電

振動板のコーナ部を支持する支持部を設け、上記筐体の内部であって、圧電振動板の周縁部と対向する位置に、上記弾性封止材を充填するための溝部を設け、上記溝部の内周側に、上記支持部より低く、上記弾性封止材が筐体の底壁部へ流れ出るのを規制する流れ止め用壁部を設けたことを特徴とする圧電型電気音響変換器を提供する。

【０００９】振動板の周縁部と筐体の内側面との間に粘性の低い弾性封止材を塗布すると、弾性封止材は振動板と筐体との隙間を通って筐体の底壁部側へ流れ出ようとする。しかし、弾性封止材は筐体に設けられた溝部に流れこみ、さらにこの溝部の内周に形成された流れ止め用壁部でせき止められるので、弾性封止材が筐体の底壁部側へ流れ出るのが防止される。そのため、振動板の周縁部と筐体の内側面との間に弾性封止材が介在し、両者の間を確実に封止できる。上記流れ止め用壁部の高さは、振動板を支持する支持部より低い。そのため、振動板の裏面に流れ止め用壁部が接触せず、振動板の振動を阻害しない。その結果、振動特性の良好な圧電型電気音響変換器が得られる。

【００１０】請求項２のように、流れ止め用壁部の頂面と振動板の裏面との間隔は、硬化前の弾性封止材の表面張力により液止まりが生じる程度の間隔がよい。例えば、弾性封止材の硬化前の粘度が１３００ｍＰａ・ｓの場合、上記間隔を０．２ｍｍ以下とするのがよい。上記間隔を広くし過ぎると、弾性封止材が筐体の底壁部側へ流れ出る可能性があるからである。

【００１１】請求項３のように、筐体を底壁部と側壁部とを有する凹型のケースと、ケースの側壁部頂面に接着される蓋板とで構成し、ケースの側壁部内面に、圧電振動板の周縁部をガイドするテーパ状の突起部を設けるのがよい。圧電振動板は電極間に交番信号を印加することにより厚み方向に屈曲振動するが、その周縁部がケースの内側面に広い面積で接触すると、振動板の振動を抑制することになり、音圧が低下する。そこで、ケースの側壁部内面に振動板の周縁部と小面積で接触するテーパ状の突起部を設けることで、振動の抑制を防止している。また、突起部はガイド機能があるので、ケースの内寸と振動板の外寸との寸法差をできるだけ小さくでき、小型の圧電音響部品を得ることができる。

【００１２】請求項４のように、筐体を底壁部と側壁部とを有する凹型のケースと、ケースの側壁部頂面に接着される蓋板とで構成した場合、ケースの側壁部の上縁内面に、弾性封止材のはい上がり規制用の凹部を形成するのがよい。ケースの側壁部の上面に蓋板を接着する場合、弾性封止材が側壁部上面まではい上がると、蓋板の接着強度が低下し、振動板の表側に形成される音響空間に空気漏れが生じることがある。そこで、弾性封止材のはい上がりをケースの側壁部の上縁内面に形成した凹部で阻止することによって、蓋板の接着強度を確保できる。

【００１３】

【発明の実施の形態】図１は本発明にかかる表面実装型の圧電型電気音響変換器の一例を示す。この実施形態の電気音響変換器は、圧電レシーバのように広いレンジの周波数に対応する用途に適したものであり、積層構造の圧電振動板１とケース１０と蓋板２０とを備えている。ここでは、ケース１０と蓋板２０とで筐体が構成される。

【００１４】振動板１は、図２，図３に示すように、２層の圧電セラミックス層１ａ，１ｂを積層したものであり、振動板１の表裏主面には主面電極２，３が形成され、セラミックス層１ａ，１ｂの間には内部電極４が形成されている。２つのセラミックス層１ａ，１ｂは、太線矢印で示すように厚み方向において同一方向に分極されている。表側の主面電極２と裏側の主面電極３は、振動板１の辺長よりやや短く形成され、その一端は振動板１の一方の端面に形成された端面電極５に接続されている。そのため、表裏の主面電極２，３は相互に接続されている。内部電極４は主面電極２，３とほぼ対称形状に形成され、内部電極４の一端は上記端面電極５と離れており、他端は振動板１の他端面に形成された端面電極６に接続されている。なお、振動板１の他端部の表裏面には、端面電極６と導通する補助電極７が形成されている。

【００１５】振動板１の表裏面には、主面電極２，３を覆う樹脂層８，９が形成されている。この樹脂層８，９は、落下衝撃による振動板１の割れを防止する目的で設けられた保護層である。表裏の樹脂層８，９には、振動板１の対角のコーナ部近傍に、主面電極２，３が露出する切欠部８ａ，９ａと、補助電極７が露出する切欠部８ｂ，９ｂとが形成されている。なお、切欠部８ａ，８ｂ，９ａ，９ｂは表裏一方にのみ設けてもよいが、表裏の方向性をなくすため、この例では表裏面に設けてある。また、補助電極７は、一定幅の帯状電極とする必要はなく、切欠部８ｂ，９ｂに対応する箇所のみ設けてもよい。ここでは、セラミックス層１ａ，１ｂとして１０ｍｍ×１０ｍｍ×４０μｍのＰＺＴ系セラミックスを使用し、樹脂層８，９として厚みが３～１０μｍのポリアミドイミド系樹脂を使用した。

【００１６】ケース１０は、図４～図１０に示すように、樹脂材料で底壁部１０ａと４つの側壁部１０ｂ～１０ｅとを持つ四角形の箱型に形成されている。樹脂材料としては、ＬＣＰ（液晶ポリマー），ＳＰＳ（シンジオタクチックポリスチレン），ＰＰＳ（ポリフェニレンサルファイド），エポキシなどの耐熱樹脂が望ましい。４つの側壁部１０ｂ～１０ｅのうち、対向する２つの側壁部１０ｂ，１０ｄの内側に、端子１１，１２の二股状の内側接続部１１ａ，１２ａが露出している。端子１１，１２は、図１１に示すような形状を有しており、ケース

１０にインサート成形されている。ケース１０の外部に露出した外側接続部１１ｂ，１２ｂが側壁部１０ｂ，１０ｄの外面に沿ってケース１０の底面側へ折り曲げられている（図６参照）。

【００１７】ケース１０の内部の４隅部には、振動板１のコーナ部を支持するための支持部１０ｆが形成されている。この支持部１０ｆは上記端子１１，１２の内側接続部１１ａ，１２ａの露出面より一段低く形成されている。そのため、支持部１０ｆ上に振動板１を載置すると、振動板１の天面と端子１１，１２の内側接続部１１ａ，１２ａの上面とがほぼ同一高さになる。

【００１８】また、ケース１０の底壁部１０ａの周辺部には後述する弾性封止材１５を充填するための溝部１０ｇが設けられ、この溝部１０ｇの内側に、上記支持部１０ｆより低い流れ止め用壁部１０ｈが設けられている。この流れ止め用壁部１０ｈは、弾性封止材１５が底壁部１０ａへ流れ出るのを規制する機能を有するものである。この実施形態では、溝部１０ｇの底面は底壁部１０ａの上面より高い位置にあり、比較的少量の弾性封止材１５で溝部１０ｇが満たされるよう、溝部１０ｇは浅底に形成されている。溝部１０ｇおよび壁部１０ｈは、後述する弾性支持材または接着剤１５を塗布する部分を除く底壁部１０ａの周辺部に設けたものであるが、底壁部１０ａの全周に設けてもよい。

【００１９】また、ケース１０の側壁部１０ｂ～１０ｅの内面には、圧電振動板１の４辺をガイドするテーパ状の突起部１０ｉが設けられている。突起部１０ｉは、各側壁部１０ｂ～１０ｅにそれぞれ２個ずつ設けられている。ケース１０の側壁部１０ｂ～１０ｅの上縁内面には、弾性封止材１５のはい上がり規制用の凹部１０ｊが形成されている。また、側壁部１０ｅ寄りの底壁部１０ａには、第１の放音孔１０ｋが形成されている。ケース１０の側壁部１０ｂ～１０ｅのコーナ部頂面には、蓋板２０の角部を嵌合保持するための略Ｌ字形の位置決め凸部１０ｍが形成されている。これら凸部１０ｍの内面には、蓋板２０をガイドするためのテーパ面１０ｎが形成されている。

【００２０】振動板１はケース１０に収納され、そのコーナ部が支持部１０ｆで支持される。このとき、ケース１０の側壁部１０ｂ～１０ｅの内面に設けられたテーパ状の突起部１０ｉによって、振動板１の周縁部がガイドされるので、振動板１のコーナ部が支持部１０ｆ上に正確に載置される。特に、テーパ状の突起部１０ｉを設けることによって、振動板１を挿入する精度以上に振動板１とケース１０とのクリアランスを狭くすることができ、その結果、製品寸法を小さくすることができる。また、突起部１０ｉと振動板１の周縁部との接触面積が小さいので、振動板１の振動が阻害されるのを防ぐことができる。

【００２１】振動板１をケース１０に収納した後、図１０に示すように弾性支持材１３を４箇所に塗布することによって端子１１，１２の内側接続部１１ａ，１２ａに固定される。すなわち、対角位置にある切欠部８ａに露出する主面電極２と端子１１の一方の内側接続部１１ａとの間、および切欠部８ｂに露出する補助電極７と端子１２の一方の内側接続部１２ａとの間に、弾性支持材１３が塗布される。また、残りの対角位置にある２箇所についても弾性支持材１３が塗布される。なお、ここでは弾性支持材１３を横長な楕円形あるいは長円形に塗布したが、塗布形状はこれに限るものではない。弾性支持材１３としては、例えば硬化後のヤング率が比較的低い接着剤、例えば３．７×10^6 Ｐａ程度のウレタン系接着剤が使用される。また、弾性支持材１３は未硬化状態での粘性が高く（例えば５０～１２０ｄＰａ・ｓ）、滲みにくい性質を有するものがよい。その理由は、弾性支持材１３を塗布したとき、弾性支持材１３が振動板１とケース１０との隙間を通って下方へ流れ落ちないようにするためである。弾性支持材１３を塗布した後、加熱硬化させる。なお、振動板１の固定方法としては、振動板１をケース１０に収納した後でディスペンサなどで弾性支持材１３を塗布してもよいが、振動板１に予め弾性支持材１３を塗布した状態で振動板１をケース１０に収容してもよい。

【００２２】弾性支持材１３を硬化させた後、導電性接着剤１４を弾性支持材１３の上を交差するように楕円形あるいは細長形状に塗布し、主面電極２と端子１１の内側接続部１１ａ、補助電極７と端子１２の内側接続部１２ａとをそれぞれ接続する。導電性接着剤１４としては、例えば硬化後のヤング率が０．３×10^9 Ｐａのウレタン系導電ペーストが使用される。導電性接着剤１４を塗布した後、これを加熱硬化させる。導電性接着剤１４の塗布形状は楕円形に限るものではなく、主面電極２と内側接続部１１ａ、補助電極７と内側接続部１２ａとを接続できればよい。

【００２３】導電性接着剤１４を塗布，硬化させた後、弾性封止材１５を振動板１の周囲全周とケース１０の内周部との隙間に塗布し、振動板１の表側と裏側との間の空気漏れを防止する。弾性封止材１５を環状に塗布した後、加熱硬化させる。弾性封止材１５としては、例えば硬化後のヤング率が低く（例えば３．０×10^5 Ｐａ程度）、かつ硬化前の粘度が低い（例えば１３００ｍＰａ・ｓ）熱硬化性接着剤が使用される。ここでは、シリコーン系接着剤を使用した。

【００２４】弾性封止材１５を塗布したとき、その粘度が低いので、弾性封止材１５が圧電振動板１とケース１０との隙間を通って底壁部１０ａへ流れ落ちる恐れがある。しかし、図９に示すように振動板１の周縁部と対向するケース１０の内側に弾性封止材１５を充填するための溝部１０ｇが設けられ、この溝部１０ｇの内側に流れ止め用壁部１０ｈが設けられているので、弾性封止材１

５は溝部１０ｇに留まり、底壁部１０ａへ流れ落ちるのが防止される。特に、流れ止め用壁部１０ｈは支持部１０ｆより低いので、振動板１と流れ止め用壁部１０ｈの間には微小な隙間Ｄが形成される。この隙間Ｄは、弾性封止材１５の表面張力による液止まり作用が得られる寸法とする必要があり、弾性封止材１５の粘度が１３００ｍＰａ・ｓの場合、隙間Ｄを０．２ｍｍ以下とするのがよい。そのため、溝部１０ｇから溢れた弾性封止材１５はこの隙間Ｄでせき止められ、底壁部１０ａへの流出は確実に防止される。なお、振動板１と流れ止め用壁部１０ｈとの間に隙間Ｄを設けるのは、振動板１の裏面に壁部１０ｈが接触することによってその振動が抑制されるのを防止するためである。

【００２５】また、弾性封止材１５の一部がケース１０の側壁部１０ｂ～１０ｅをはい上がり、側壁部の頂面に付着する可能性がある。弾性封止材１５が離型性のある封止剤の場合、後で蓋板２０を側壁部１０ｂ～１０ｅの頂面に接着する際に接着強度が低下する恐れがある。しかし、側壁部１０ｂ～１０ｅの上縁内面には、弾性封止材１５のはい上がり規制用の凹部１０ｊが形成されているので、弾性封止材１５が側壁部の頂面に付着するのを防止できる。

【００２６】上記のように振動板１をケース１０に固定した後、ケース１０の側壁部頂面に蓋板２０が接着剤２１によって接着される。蓋板２０はケース１０と同様な材料で平板状に形成されている。蓋板２０の周縁部が、上記ケース１０の側壁部頂面に突設された位置決め用凸部１０ｍの内側テーパ面１０ｎに係合され、正確に位置決めされる。蓋板２０をケース１０に接着することで、蓋板２０と振動板１との間に音響空間が形成される。蓋板２０には、第２の放音孔２２が形成されている。上記のようにして表面実装型の圧電型電気音響変換器が完成する。

【００２７】この実施形態の電気音響変換器では、端子１１，１２間に所定の交番電圧を印加することで、振動板１を面積屈曲モードで屈曲振動させることができる。分極方向と電界方向とが同一方向である圧電セラミックス層は平面方向に縮み、分極方向と電界方向とが逆方向である圧電セラミックス層は平面方向に伸びるので、全体として厚み方向に屈曲する。この実施形態では、振動板１がセラミックスの積層構造体であり、厚み方向に順に配置された２つの振動領域（セラミックス層）が相互に逆方向に振動するので、ユニモルフ型振動板に比べて大きな変位量、つまり大きな音圧を得ることができる。

【００２８】本発明は上記実施形態に限定されるものではなく、本発明の趣旨を逸脱しない範囲で変更可能である。上記実施形態では、ケース１０の内側の４隅部に支持部１０ｆを設け、これら支持部１０ｆで振動板１の４つのコーナ部を支持するようにしたが、これに代えてケース１０の対向する２辺に段差状の支持部を形成し、この支持部上に振動板１の対向する２辺を支持するようにしてもよい。弾性封止材の塗布領域は、実施形態のような振動板１の周囲全周に限るものではなく、上述のように振動板の対向する２辺とケースの支持部とを連続的に弾性支持材で固定した場合には、残りの２辺とケースとの隙間に弾性封止材を塗布してもよい。

【００２９】上記実施形態の圧電振動板１は２層の圧電セラミックス層を積層したものであるが、３層以上の圧電セラミックス層を積層したものでもよい。また、圧電振動板として、圧電セラミックス層の積層体に限らず、金属板の片面または両面に圧電板を貼り付けた公知のユニモルフ型またはバイモルフ型振動板を用いてもよい。本発明の筐体は、実施形態のような凹断面形状のケース１０と、その上面開口部に接着される蓋板２０とで構成されたものに限らず、下面が開口したキャップ形状のケースと、このケースの下面に接着される基板とで構成してもよい。この場合には、基板に予め端子となる電極パターンを形成しておけばよい。

【００３０】

【発明の効果】以上の説明で明らかなように、請求項１に記載の発明によれば、筐体の内部に、弾性封止材を充填するための溝部と、この溝部の内側に流れ止め用壁部とを設けたので、粘性の低い弾性封止材を用いても、弾性封止材が筐体の底面側へ流れ出るのが防止され、振動板の周縁部と筐体の内側面との間を弾性封止材で確実に封止できる。そのため、作業性の向上と封止性とを両立させることができるとともに、硬化後の弾性封止材のヤング率を低くできるので、振動板の振動特性も良好となる。また、流れ止め用壁部の高さは振動板を支持する支持部より低いので、振動板の裏面に流れ止め用壁部が接触せず、振動板の振動が阻害されるのを防止できる。

【図面の簡単な説明】

【図１】本発明に係る圧電型電気音響変換器の第１実施形態の分解斜視図である。

【図２】図１の圧電型電気音響変換器に用いられる圧電振動板の斜視図である。

【図３】図２のＡ－Ａ線による階段断面図である。

【図４】図１の圧電型電気音響変換器に用いられるケースの平面図である。

【図５】図４のＸ－Ｘ線断面図である。

【図６】図４のＹ－Ｙ線断面図である。

【図７】図４に示すケースの底面図である。

【図８】図４に示すケースのコーナ部の拡大斜視図である。

【図９】図５のＢ部の弾性封止材を塗布した状態の拡大図である。

【図１０】図４に示すケースに振動板を収納した状態の平面図である。

【図１１】端子の斜視図である。

【図１２】高粘度の弾性封止材を用いた場合の従来の封

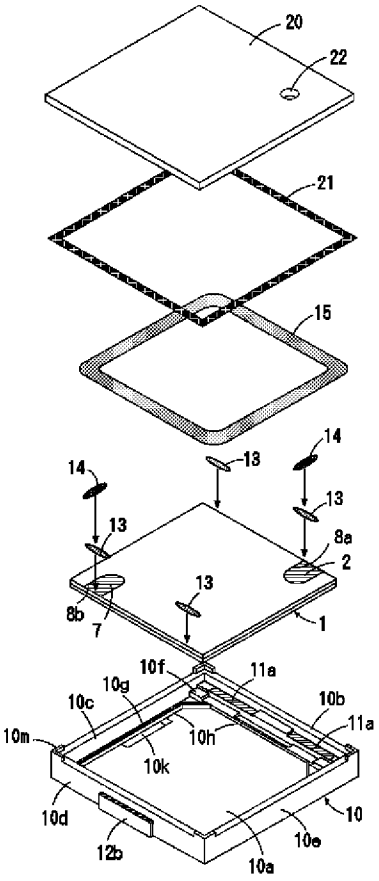
止部の断面図である。

【図１３】低粘度の弾性封止材を用いた場合の従来の封止部の断面図である。

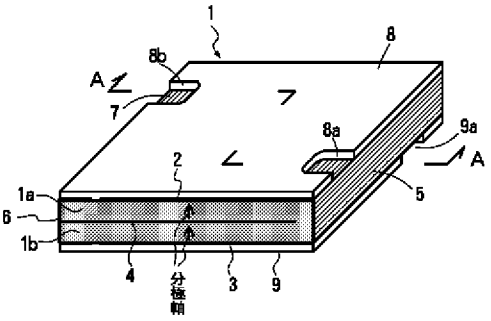
【符号の説明】

１	圧電振動板
１０	ケース
１０ａ	底壁部
１０ｂ～１０ｄ	側壁部
１０ｆ	支持部
１０ｇ	溝部
１０ｈ	流れ止め用壁部
１０ｉ	テーパ状突起部
１０ｊ	はい上がり規制用凹部
１３	弾性支持材
１４	導電性接着剤
１５	弾性封止材
２０	蓋板

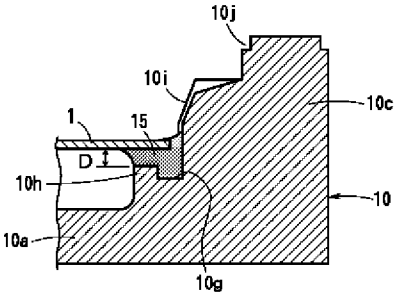
【図１】



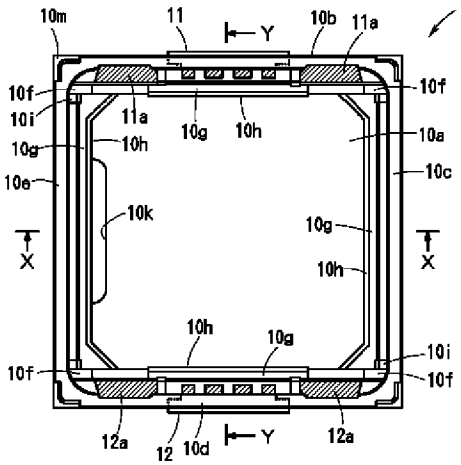
【図２】



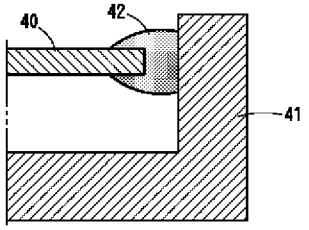
【図９】



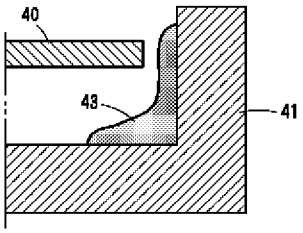
【図４】



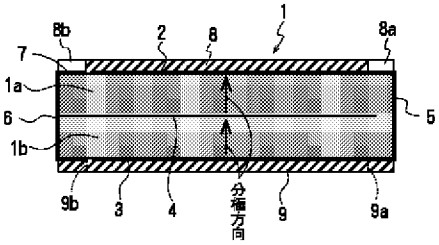
【図１２】



【図１３】



【図３】



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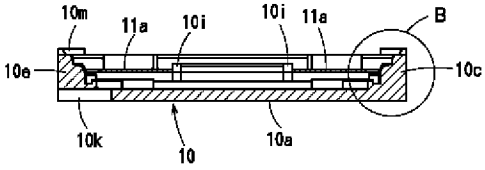

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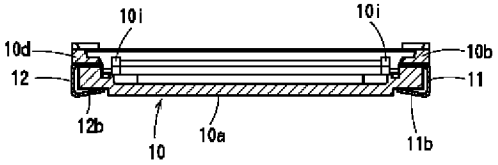

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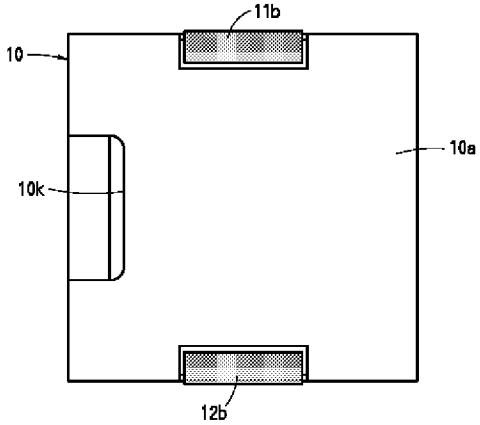

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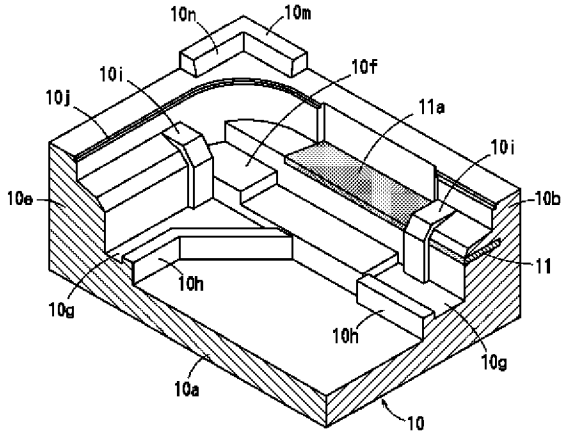

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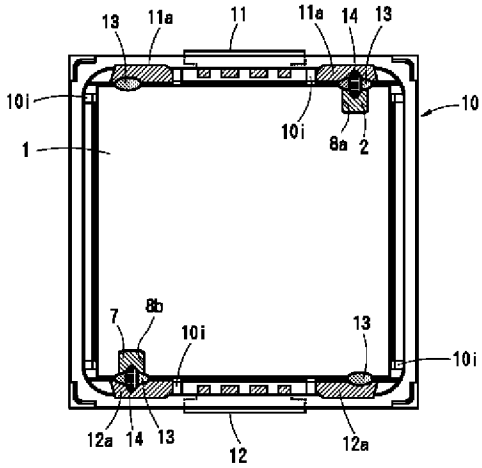
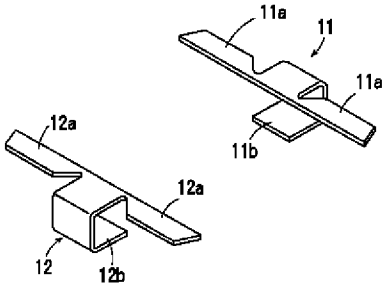


【図１１】



フロントページの続き

(72)発明者　竹島　哲夫
京都府長岡京市天神２丁目26番10号　株式会社村田製作所内

(72)発明者　横井　雄行
京都府長岡京市天神２丁目26番10号　株式会社村田製作所内

(72)発明者　奥澤　匡
京都府長岡京市天神２丁目26番10号　株式
会社村田製作所内

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